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EXTENSION

Institute of Food and Agricultural Sciences

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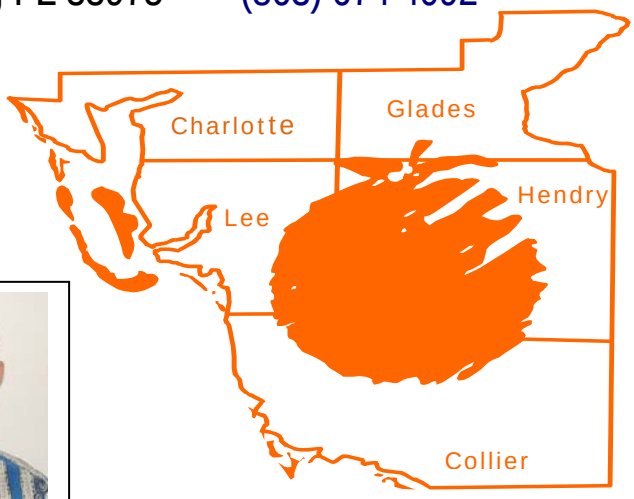
Flatwoods Citrus



Vol. 16, No. 7 **July 2013**

Dr. Mongi Zekri
Multi-County Citrus Agent, SW Florida

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Previous issues of the Flatwoods Citrus newsletter can be found at:
http://citrusagents.ifas.ufl.edu/agents/zekri/index.htm
http://irrec.ifas.ufl.edu/flcitrus/

I M P O R T A N T E V E N T S

SEMINAR

Brown rot, citrus black spot, breeding for HLB resistance, Quadris Top

Program Coordinator: Dr. Mongi Zekri, UF-IFAS Extension
Program Sponsor: Cody Hoffman with Syngenta
Date: Tuesday, August 6th, 2013, Time: **10:00 AM** – 12:10 PM
Location: UF-IFAS Southwest Florida Research and Education Center
2685 SR 29, Immokalee, FL 34142 See: **http://www.imok.ufl.edu/** for directions

Agenda

10:00 AM – 10:45 AM

1. Brown rot and citrus black spot (CBS) management **- Dr. Megan Dewdney, UF-IFAS**

10:45 AM – 11:10 AM

2. Practical control strategies for CBS **– Paul Meador, Everglades Harvesting**

11:10 AM – 11:20 AM - Break

11:20 AM – 12:00 Noon

3. Breeding citrus for citrus greening (HLB) resistance **- Dr. Jude Grosser, UF-IFAS**

12:00 Noon – 12:10 PM

4. "Quadris Top" pesticide **- Cody Hoffman, Syngenta**

2 CEUs for Pesticide License Renewal

2 CEUs for Certified Crop Advisors (CCAs)

Pre-registration is required. No registration fee and lunch is free Thanks to **Cody Hoffman with Syngenta.** To reserve a seat, call 863 674 4092, or send an e-mail to Dr. Mongi Zekri: maz@ufl.edu

Presentations from 2013 Florida Citrus Growers' Institute

The 2013 Institute held on April 2 in Avon Park drew over 300 growers to the South Florida State College campus. For those of you who attended and those who could not make it, video recordings were made of the presentations and most of them are posted on the Citrus Agents Website.
http://citrusagents.ifas.ufl.edu/events/GrowersInstitute2013/GrowersInstitute2013.htm

CITRUS EXPO

IN FORT MYERS

Wednesday, August 14 &
Thursday, August 15, 2013

www.CitrusExpo.net

Special Thanks to sponsors of the "Flatwoods Citrus" newsletter for their generous contribution and support. If you would like to be among them, please contact me at 863 674 4092 or maz@ufl.edu

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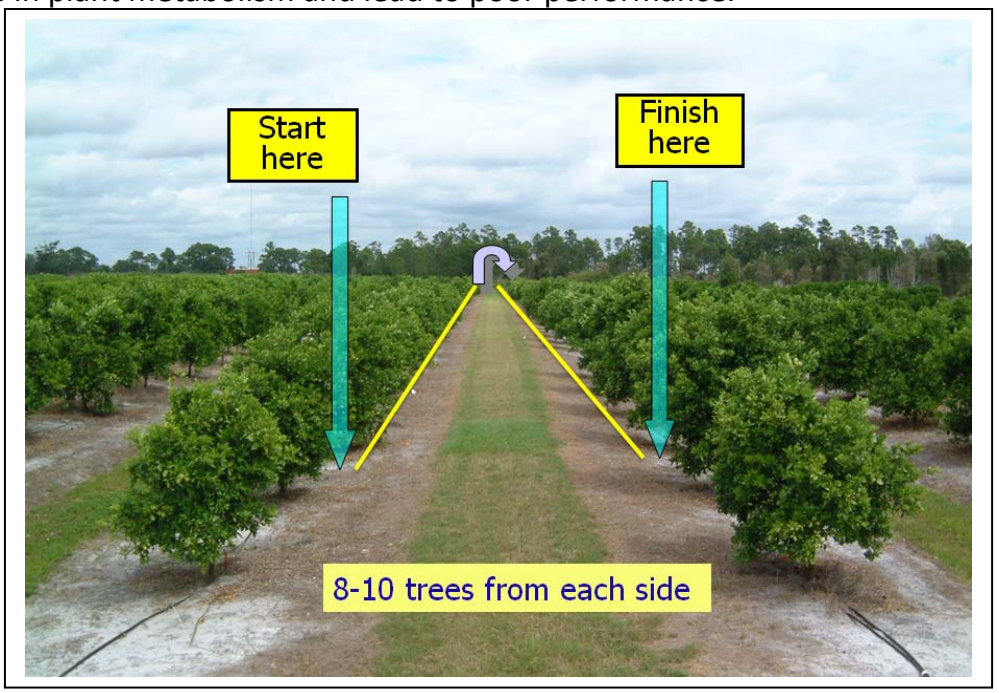
HOW TO ADJUST FERTILIZER PROGRAMS FOR CITRUS TREES?

Mongi Zekri & Tom Obreza

Optimum growth and yield of high quality fruit cannot be obtained without adequate nutrition. The most successful fertilizer program should be based on tissue analysis, knowledge of soil nutrient status through soil analysis combined with university recommendations. The deficiency or excess of an element will cause disturbance in plant metabolism and lead to poor performance.



Plant analysis

Used in conjunction with other data and observations, tissue analysis aids in evaluating the nutrient elements of the soil-plant system. It has proven useful in confirming nutritional deficiencies, toxicities or imbalances, identifying "hidden" toxicities and deficiencies where visible symptoms are not manifested, and evaluating the effectiveness of fertilizer programs.

Leaf Sampling

For reliable results and useful interpretation of lab analysis reports, citrus growers, production managers, and consultants must follow the proper procedures for leaf sampling and sample handling because improperly collected leaf samples will provide misleading information about the nutritional status of the trees and the fertilizer programs.

Considerable care is needed in taking samples. Chemical analysis values can only be useful if the samples obtained are representative of the blocks they were taken from. The proper sampling, preparation and handling would affect the reliability of the chemical analysis, data interpretation, nutritional recommendations, and adjustment of fertilizer programs.

Leaf samples must also be taken at the proper time because nutrient levels within leaves are continually changing. However, leaf mineral concentrations of most nutrients are relatively stable within 4 to 6 months after emergence of the spring flush. Therefore, for mature tree blocks, the best time would be in **July and August** to collect four- to six-month-old spring flush leaves. If taken later in the season, the summer flush would probably be confused with the spring flush.

Each leaf sample should consist of about 100 leaves taken from non-fruiting twigs of 15- 20 uniform trees of the same variety and rootstock, and under the same fertilizer program. Clean brown paper bag should be used. Information sheets from the testing lab should be completed for each sample as this information helps when interpreting the results. The sample bag and the corresponding information sheet should each be carefully labeled with the same identity so that samples and sheets can be matched in the laboratory.

Sampling techniques for leaves

♦ Immature leaves should be avoided because of their rapidly changing composition.

♦ Abnormal-appearing trees, trees at the edge of the block and trees at the end of rows should not be sampled because they may be coated with soil particles and dust or have other problems.

♦ Do not include diseased, insect-damaged, or dead leaves in a sample. Use good judgment.

♦ Select only one leaf from a shoot and remove it with its petiole (leaf stem).

Diagnosing growth disorders

♦ Collect samples from both affected trees as well as normal trees.

♦ Trees selected for sampling should be at similar stage of development and age.

♦ Whenever possible, confine the sampling area to trees in close proximity to each other.

Handling of leaf samples

♦ Samples should be collected in clean paper bags and clearly identified.

♦ They should be protected from heat and kept dry and cool (stored in portable ice chests), and placed in a refrigerator for overnight storage if they cannot be washed and oven dried the same day of collection.

♦ For macronutrient analysis, leaves usually do not need to be washed.

♦ Leaves should be dried in a ventilated oven at 60-70^{o}C.

Preparation for analysis

♦ Leaves that have been recently sprayed with micronutrients for fungicidal (Cu) or nutritional (Mn, Zn) purposes should not be analyzed for those micronutrients because it is unlikely to remove all surface contamination from sprayed leaves.

♦ For accurate Fe and B or other micronutrient determination, samples would require hand washing, which is best done when leaves are still in a fresh condition.

Soil analysis

Soil analysis is an important method for gaining basic information regarding the chemical status of the soil. Soil analysis is particularly useful when conducted over several years so that trends can be seen.

Unlike leaf analysis, there are various methods and analytical procedures of soil analysis used by laboratories. In Florida, soil tests for the relatively mobile and readily leached elements such as N and K are of no value. Soil tests are mainly important for pH, P, Mg, Ca, and Cu. For Florida sandy soils, using the Mehlich-1 or double acid (hydrochloric acid + sulfuric acid) extraction procedure adopted by the University of Florida analytical lab, 40-60 lbs/acre (20-30 ppm) of P, 70-120 lbs/acre (35-60 ppm) of Mg, 500-800 lbs/acre (250-400 ppm) of Ca, and 5-10 lbs/acre (2.5-5 ppm) of Cu are considered adequate for citrus. A Ca:Mg ratio of 7:1 seems desirable and ratios of higher than 10 may induce Mg deficiency problems. Copper levels higher than 50 lbs/acre may be toxic to citrus trees if the soil pH is below 6.

Soil sampling

The accuracy of a fertilizer recommendation depends on how well the soil sample on which the recommendation was based represents the area of the grove. In Florida, if soil samples were to be

collected once a year, the best time would be at the end of the summer rainy season and prior to fall fertilization, usually during September and October. However, soil sampling may be conducted at the same time as leaf sampling to save time and reduce cost.

Standard procedures for proper sampling, preparation and analysis have to be followed for meaningful interpretations of the test results and accurate recommendations. Each soil sample should consist of 15-20 soil cores taken at the dripline of 15-20 trees within the area wetted by the irrigation system to a depth of 6 inches. The area sampled should be uniform in terms of soil and tree characteristics and correspond to the area from which the leaf sample was taken. Individual cores should be mixed thoroughly in a plastic bucket to form a composite sample. Subsample of appropriate size should be taken from the composite mixture and put into labeled paper bags supplied by the lab. Soil samples should be air-dried but not oven-dried before shipping to the testing laboratory for analysis.

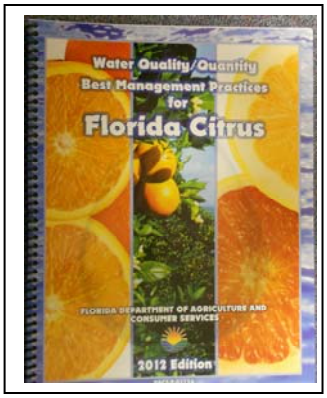
Conclusion

Tissue and soil analyses are a powerful tool for confirming nutrient deficiencies, toxicities and imbalances, identifying "hidden hunger," evaluating fertilizer programs, studying nutrient interactions. However, if initial plant and soil sampling, handling, and analysis of the sample were faulty, the results would be misleading. If properly done, tissue and soil analyses can point the way toward more economical and efficient use of fertilizer materials, avoiding excessive or inadequate application rates.

Leaf analysis standard Table for assessing current nutrient status of citrus trees based on concentration of mineral elements in 4- to 6-month-old-spring-cycle leaves from non-fruiting terminals.

Element	Deficient less than	Low	Satisfactory	High	Excess more than
Nitrogen (N) (%)	2.2	2.2-2.4	**2.5-2.8**	2.9-3.2	3.3
Phosphorus (P) (%)	0.09	0.09-0.11	**0.12-0.17**	0.18-0.29	0.30
Potassium (K) (%)	0.7	0.7-1.1	**1.2-1.7**	1.8-2.3	2.4
Calcium (Ca) (%)	1.5	1.5-2.9	**3.0-5.0**	5.1-6.9	7.0
Magnesium (Mg) (%)	0.20	0.20-0.29	**0.30-0.50**	0.51-0.70	0.80
Sulfur (S) (%)	0.14	0.14-0.19	**0.20-0.40**	0.41-0.60	0.60
Chlorine (Cl) (%)	------	------	**less than 0.5**	0.5-0.7	0.7
Sodium (Na) (%)	------	------	**less than 0.2**	0.2-0.5	0.5
Iron (Fe) (ppm)	35	35-59	**60-120**	121-200	250
Boron (B) (ppm)	20	20-35	**36-100**	101-200	250
Manganese (Mn) (ppm)	18	18-24	**25-100**	101-300	500
Zinc (Zn) (ppm)	18	18-24	**25-100**	101-300	300
Copper (Cu) (ppm)	4	4-5	**6-16**	17-20	20
Molybdenum (Mo) (ppm)	0.06	0.06-0.09	**0.1-1.0**	2-50	50

For more details, consult UF-IFAS publication SL 253, "Nutrition of Florida Citrus Trees," at http://edis.ifas.ufl.edu/pdffiles/SS/SS47800.pdf



Department adopts new statewide citrus BMP manual

The Florida Department of Agriculture and Consumer services (FDOACS) adopted a new statewide citrus BMP manual, *Water Quality/Quantity Best Management Practices for Florida Citrus*, on Jan. 9. This new manual incorporates the four region-based citrus programs: Ridge Citrus, Indian River Citrus, Gulf Citrus and the Peace River/Manasota basins. All citrus operations that enroll in department BMPs as of Jan. 9 must submit a Notice of Intent (NOI) under the new statewide manual.

Over the past month, growers representing about 10,000 acres have enrolled or re-enrolled under the new statewide citrus manual. Benefits of participation include a presumption of compliance with state water quality standards, a release from fines or damages related to pollutants addressed by BMPs, and eligibility for BMP implementation cost-share funds.

Ridge Citrus Growers

Growers now participating in the Ridge Citrus BMP have until Jan. 8, 2015, to enroll in the statewide manual and implement applicable BMPs, in order to maintain their presumption of compliance with state water quality standards. Notices of Intent to implement BMPs submitted under the previous Ridge Citrus rule will be invalid after this 2-year period.

David “Bo” Griffin is leading the effort to reenroll Ridge Citrus growers in the new statewide manual, and can be contacted at (863) 402-7020 or David.Griffin@FreshFromFlorida.com. Growers also may contact Susie Bishop at sbishop@highlandsswcd.org. Please contact Bo or Susie for Ridge Citrus reenrollment or first-time enrollment soon to take advantage of cost-share opportunities.

Flatwoods Citrus Growers

Growers currently enrolled under one of the three region-based Flatwoods Citrus Manuals (Indian River, Gulf and Peace River/Manasota) are grandfathered under the new rule.

However, growers must continue to implement the applicable BMPs and must follow guidelines in Nutrition of Florida Citrus Trees, Second Edition, UF/IFAS Publication SL253 from January 2008, that are relevant to their operations.
Flatwoods Citrus growers who are re-establishing or renovating groves already enrolled under a region-based manual must contact the department for assistance in submitting an NOI under the new statewide manual at (850) 617-1727 or AgBMPHelp@FreshFromFlorida.com.
In the Gulf region, to get more information, to enroll, and/or to get a hard copy of the citrus BMP manual, contact Callie Walker, Office of Agricultural Water Policy, Florida Department of Agriculture & Consumer Services, 483 E. Cowboy Way, LaBelle, FL 33935, Phone: 863-674-4160, Fax: 863-674-4161, Callie.Walker@FreshFromFlorida.com or Mongi Zekri at 863 674 4092, maz@ufl.edu

BROWN ROT MANAGEMENT

Management of brown rot, caused by *Phytophthora nicotianae* or *P. palmivora*, is needed on both processing and fresh market fruit. While the disease can affect all citrus types, it is usually most severe on Hamlin and other early maturing
sweet orange cultivars.

Phytophthora brown rot is a localized problem usually associated with restricted air and/or water drainage. It commonly appears from mid-August through October following periods of extended high rainfall. It can be confused with fruit drop due to other causes at that time of the year. If caused by *P. nicotianae*, brown rot is limited to the lower third of the canopy because the fungus is splashed onto fruit from the soil. *P. palmivora* produces airborne sporangia and can affect fruit throughout the canopy.

Early season inoculum production and spread of *Phytophthora* spp. are minimized with key modifications in cultural practices. Skirting of the trees reduces the opportunity for soil-borne inoculum to contact fruit in the canopy. The edge of the herbicide strip should be maintained just inside of the dripline of the tree to minimize the exposure of bare soil to direct impact by rain. This will limit rain splash of soil onto the lower canopy. Boom application of herbicides and other operations dislodge low-hanging fruit. Fruit on the ground becomes infected and produces inoculum of *P. palmivora* that can result in brown rot infection in the canopy as early as July while fruit are still green. The beginning stages of the epidemic are very difficult to detect before the fruit are colored and showing typical symptoms. Application of residual herbicides earlier in the summer may reduce the need for post-emergence materials later and minimize fruit drop throughout this early stage of inoculum production from fallen fruit.

Usually a single application of Aliette, Phostrol or ProPhyt before the first signs of brown rot appear in late July is sufficient to protect fruit through most of the normal infection period. No more than 20 lb/acre/year of Aliette should be applied for the control of all Phytophthora diseases. Aliette, Phostrol and ProPhyt are systemic fungicides that protect against postharvest infection and provide 60-90 days control. Copper fungicides are primarily protective but are capable of killing sporangia on the fruit surface and thus reducing inoculum. They may be applied in August before or after brown rot appearance and provide protection for 45-60 days. If the rainy season is prolonged into the fall, a follow-up application of either systemic fungicides at one-half of the label rate, or copper in

October may be warranted. With average quality copper products, usually 2-4 lb of metallic copper per acre are needed for control.
Precautions should be taken during harvesting not to include brown rot-affected fruit in the field containers as this could result in rejection at the processing or packing facility.

Recommended Chemical Controls for Brown Rot of Fruit

Pesticide	**FRAC MOA[2]**	**Mature Trees Rate/Acre[1]**
Aliette WDG	33	5 lb
Phostrol	33	4.5 pints
ProPhyt	33	4 pints
copper fungicide	M1	Use label rate.

[1]Lower rates may be used on smaller trees. Do not use less than minimum label rate.
[2]Mode of action class for citrus pesticides from the Fungicide Resistance Action Committee (FRAC) 2012. Refer to ENY624, Pesticide Resistance and Resistance Management, in the 2013 Florida Citrus Pest Management Guide for more details.

Rates for pesticides are given as the maximum amount required to treat mature citrus trees unless otherwise noted. To treat smaller trees with commercial application equipment including handguns, mix the per acre rate for mature trees in 250 gallons of water. Calibrate and arrange nozzles to deliver thorough distribution and treat as many acres as this volume of spray allows.

For more information, go to: **Florida Citrus Pest Management Guide: Brown Rot of Fruit at: *http://www.crec.ifas.ufl.edu/extension/pest/PDF/2013/Brown%20Rot.pdf***

National Biosolids Partnership

FREQUENTLY ASKED QUESTIONS ABOUT BIOSOLIDS

1) What are Biosolids?

Biosolids are the nutrient-rich solid organic matter recovered from the treatment of domestic sewage in a wastewater treatment facility. Biosolids are a beneficial resource, containing essential plant nutrient and organic matter and are recycled as a fertilizer and soil amendment. When treated and processed, these residuals can be recycled and applied as fertilizer to improve and maintain productive soils and stimulate plant growth.

2) What is the difference between biosolids and sewage sludge?

Sludge is generally used before applicable beneficial recycling criteria have been achieved which normally occurs at the outlet of the stabilization process. It should be used in tandem with a specific process descriptor (e.g., *primary sludge*, *waste activated sludge*, *secondary sludge*, etc.)

Biosolids is generally used after applicable beneficial recycling criteria have been achieved, i.e., at the outlet of the stabilization process. Common stabilization processes include the following: aerobic digestion, autothermal thermophilic aerobic digestion (ATAD), anaerobic digestion, composting, alkaline stabilization, thermal drying, including flash, rotary, fluid bed, paddle, hollow-flight, disc, and infrared dryers, thermophilic pozzolanic fixation, acid oxidation/disinfection, and heat treatment/acid digestion.

3) Why do we have biosolids?

We have biosolids as a result of treating sewage sludge (i.e., the solids generated during the treatment of domestic sewage in a treatment plant) to meet the land application regulatory requirements). Wastewater treatment technology has made our water safer for recreation and seafood harvesting. Thirty years ago, thousands of American cities dumped their raw sewage directly into the nation's rivers, lakes, and bays. Through regulation of this dumping, local governments now required to treat domestic sewage and to make the decision whether to recycle the solids generated as fertilizer, incinerate them or bury them in a landfill. If the solids meet the regulatory requirements for land application and are recycled, they are biosolids.

4) How are biosolids generated and processed?

Biosolids are generated when solids generated during the treatment of domestic sewage are treated further to meet regulatory requirements. The wastewater treatment can actually begin before the wastewater reaches the treatment plant. In many larger wastewater treatment systems, pre-treatment regulations require that industrial facilities pre-treat their wastewater to remove many hazardous contaminants before it is sent to a wastewater treatment plant. Wastewater treatment facilities monitor incoming wastewater streams to ensure their recyclability and compatibility with the treatment plant process.

Sewage sludge is not generated until domestic sewage is treated in a treatment works, and biosolids are not produced until the sewage sludge meets the land application Part 503 requirements. For these reasons, the treatment of biosolids cannot occur before the domestic sewage reaches the wastewater treatment plant. Once the wastewater reaches the plant domestic sewage goes through physical, chemical and biological processes that clean the domestic sewage and remove the solids. If necessary, some of the solids are then treated with lime to raise the pH level to eliminate objectionable odors. Pathogen reduction (disease-causing organisms, such as bacteria, viruses and parasites) and other organisms capable of transporting disease for the solids usually occur in a different process (e.g., a digester).

5) How are biosolids used?

After treatment and processing, biosolids can be recycled and applied as fertilizer to improve and maintain productive soils and stimulate plant growth. The controlled land application of biosolids completes a natural cycle in the environment. By treating sewage sludge, it becomes biosolids that can be used as valuable fertilizer, instead of taking up space in a landfill or other disposal facility.

6) Are biosolids safe?

Decades of studies have demonstrated that biosolids can be safely used on food crops. The National Academy of Sciences has reviewed current practices, public health concerns and regulator standards, and has concluded that "the use of these materials in the production of crops for human consumption when practiced in accordance with existing federal guidelines and regulations, presents negligible risk to the consumer, to crop production and to the environment." In addition, an epidemiological study of the health of farm families using biosolids showed that the use of biosolids was safe.

7) Do biosolids smell?

Biosolids may have their own distinctive odor depending on the type of treatment it has been through. Some biosolids may have only a slight musty, ammonia odor. Others have a stronger odor that may be offensive to some people. Compounds that contain sulfur and ammonia, which are both plant nutrients, cause most odors.

8) Are there regulations for the land application of biosolids?

The federal biosolids rule is contained in 40 CFR Part 503. Biosolids that are to be land applied must meet these strict regulations and quality standards. The Part 503 rule governing the use and disposal of biosolids contains general requirements, numerical limits for metals in biosolids, pathogen and vector attraction reduction standards, management practices and frequency of monitoring, record keeping and reporting requirements for land applied biosolids as well as similar requirements for sewage sludge that is surface disposed or incinerated. Most recently, Part 503 requirements have been proposed to limit the concentration of dioxin and dioxin like compounds in biosolids to ensure safe land application. Biosolids are one of the most studied materials that have ever been regulated by EPA.

9) Where can I find out more about the regulations?

The biosolids rule is described in the EPA publication, A Plan English Guide to the EPA Part 503 Biosolids Rule. This guide states and interprets the Part 503 rule for the general reader. This guide is also available in hard copy. In addition to the Plain English Guide, EPA has prepare A Guide to the Biosolids Risk Assessments for the EPA Part 503 Rule which shows the many steps followed to develop the

scientifically defensible, safe set of rules (also available from EPA in hard copy.) The cited references provide valuable information about the Part 503 land application requirements. However, if the information in the references is different form the requirements in the Part 503 rule, the Part 503 rule requirements apply. A number of relevant biosolids publications are located on the National Biosolids Partnership's web page at: http://www.biosolids.org.

10) How are biosolids used for agriculture?

Biosolids are used to fertilize fields on which crops are grown. Agricultural uses of biosolids that meet strict quality criteria and application rates have been shown to produce significant improvements in crop growth and yield. Nutrients found in biosolids, such as nitrogen, phosphorus and potassium and trace elements such as calcium, copper, iron, magnesium, manganese, sulfur and zinc, are necessary for crop production and growth. The use of biosolids reduces the farmer's production costs and replenishes the organic matter that has been depleted over time. The organic matter improves soil structure by increasing the soil's ability to absorb and store moisture.

Crops use the organic nitrogen and phosphorous found in biosolids very efficiently because these plant nutrients are released slowly throughout the growing season. This enables the crop to absorb these nutrients as the crop grows. This efficiency lessens the likelihood of groundwater pollution of nitrogen and phosphorous.

11) Can biosolids be used for composting?

Yes, biosolids may be composted and sold or distributed for use on lawns and home gardens. Biosolids composted with sawdust, wood chips, yard clippings, or crop residues make excellent mulches and topsoils for horticultural and landscaping purposes. Even after composting, the sewage sludge has to meet the appropriate Part 503 requirements for it to become biosolids that can be applied to lawns and home gardens. Many professional landscapers use composted biosolids for landscaping new homes and businesses. Home gardeners also find composted biosolids to be an excellent addition to planting beds and gardens. Most biosolids compost, are highly desirable products that are easy to store, transport and use.

12) Are there rules about where biosolids can be applied?

To determine whether biosolids can be applied to a particular farm site, a good management practice includes an evaluation of the site's suitability and is generally performed by the land applier. The evaluation examines water supplies, soil characteristics, slopes, vegetation, crop needs and the distances to surface and groundwater.

There are different rules for different classes of biosolids. Class A biosolids contain no detectible levels of pathogens and must meet strict vector attraction reduction requirements and low levels metals contents. The biosolids preparer usually applies for a permit and only have to apply for permits to ensure that these very tough standards have been met. However, the Part 503 requirements have to be met even if there is no permit. Class B biosolids are treated but still contain detectible levels of pathogens. There are

buffer requirements, public access, and crop harvesting restrictions for Class B biosolids. (The land application site restrictions have to be met in all cases where Class B biosolids are land-applied.) Nutrient management planning ensures that the appropriate quantity of biosolids is land applied. The biosolids application is specifically calculated to match the nutrient uptake requirements of the particular crop. Nutrient management technicians work with the farm community to assure proper land application and nutrient control.

13) Is EPA pushing the use of biosolids as a fertilizer? Is the federal policy for biosolids driven by economics of disposal?

As a result of its decade-long assessment of biosolids, EPA concluded that recycling biosolids to land was an environmentally responsible solution, when used in accordance with the Part 503 rule. The Federal policies supporting and promoting the beneficial recycling of biosolids are based upon sound science that has demonstrated the benefits of such recycling. These policies are not driven by economics, and the choice of to recycle biosolids remains a local decision.

14) How do the risks associated with biosolids compare with other soil amendments used in agriculture?

A Water Environment Research Foundation (WERF) study completed in 2002 finds that the risks associated with biosolids are no greater than risks associated with other soil amendments used in agriculture. The project, "Evaluate Risks and Benefits of Soil Amendments Used in Agriculture" (project no. 99-PUM-1), examined the risks and benefits, advantages and potential disadvantages associated with the use of a variety of soil amendments in comparison to chemical fertilizers. Project results indicate that the relative risk to the environment from amendments and fertilizers varies by parameter and shows that known risks from each of the materials studied can be managed. Moreover, these manageable risks must be carefully weighed against the considerable benefits provided by the land application of amendments and fertilizers.

15) Is recycling much cheaper than disposal?

In areas where disposal costs have increased due to shrinking landfill space and increased costs to maintain and monitor landfills, some cities and towns find that recycling biosolids is less expensive than land filling. However, in most cases, land filling is competitive or less expensive than land application. In such cases, many U.S. communities have made a positive environmental decision to commit to recycling biosolids despite the additional cost. This is especially true where communities have committed to the additional costs of composting or heat drying and pathogen reduction processes for biosolids prior to utilization.

16) Are Biosolids good for the environment?

Recycling biosolids is good for the environment. Organic matter has been recycled for centuries to improve soil fertility and productivity. When properly applied and managed, biosolids can: provide essential plant nutrients; improve soil structure and tilth; add organic matter; enhance moisture retention; and reduce soil erosion.

Biosolids recycling is regulated and encouraged by the United States Environmental Protection Agency and state and local authorities. Research and years of recycling experience have demonstrated that properly managed land application of biosolids is environmentally safe.

CITRUS AND CALCAREOUS SOILS

For more information, consult http://edis.ifas.ufl.edu/pdffiles/SS/SS47800.pdf

Calcareous soils are alkaline (have pH values greater than 7) because of the presence of free $CaCO_3$. Calcium carbonate ($CaCO_3$) can occur naturally in soils or can be added with alkaline irrigation water. Special nutritional management is required to grow citrus successfully on calcareous soils. However, planting citrus trees on these soils may not be economically feasible. The presence of $CaCO_3$ affects the availability of almost all nutrients.

Nitrogen (N)

Nitrification, which is the conversion of ammonium (NH_4^+) to nitrate (NO_3^-) by soil bacteria, is most rapid in soils with pH values between 7 and 8. Ammonia volatilization is the loss of N to the atmosphere through conversion of the ammonium ion to ammonia gas (NH_3). Volatilization of ammoniacal-N fertilizer is significant when the soil surface pH is greater than 7. Nitrogen loss through ammonia volatilization on calcareous soils is a concern when ammoniacal N is applied on the soil surface and remains there without moving it into the soil. When applying dry fertilizer containing urea or ammoniacal N, the fertilizer should be moved into the root zone through irrigation or mechanical incorporation if rainfall or irrigation is not imminent. Applying a portion of the required N fertilizer foliarly (urea, potassium nitrate, calcium nitrate) will improve the N status. Applying N with irrigation water (fertigation) and scheduling irrigation to maintain the N in the root zone is a sound method to reduce N leaching losses.

Phosphorus (P)

When P fertilizer is added to a calcareous soil, it undergoes a series of chemical reactions with Ca. These reactions decrease P solubility through a process called P fixation. Consequently, the long-term availability of P to plants is controlled by the application rate of soluble P and the dissolution of fixed P. Applied P is available to replenish the soil solution for only a relatively short time before it converts to less soluble forms of P. Phosphorus fertilizer should be applied each year in newly planted groves on previously-non-fertilized soil until the groves begin to bear fruit. As the trees approach maturity, P applications can be limited to once every few years. Diagnostic information from leaf and soil testing can help determine whether P fertilization is necessary.

Potassium (K) & magnesium (Mg)

It is often difficult to increase K and Mg uptake with fertilizer applied to calcareous soils. High soil Ca suppresses K and Mg uptake by citrus trees through the competition of Ca, Mg, and K. In cases where soil-applied fertilizer is ineffective, the only means of increasing leaf K and Mg concentration is through foliar application of water-soluble fertilizers, such as potassium nitrate, monopotassium phosphate, or magnesium nitrate.

Mg deficiency

A solution of 20 lbs KNO_3 per 100 gallons of water has been shown to raise leaf K, especially if applied two or three times during the year.

For citrus on noncalcareous soils, nitrogen and potassium fertilizer applications with a 1:1 ratio of N to K_2O are recommended. If leaf testing on calcareous soils reveals that high soil Ca may be limiting K uptake, the K_2O rate should be increased by about 25% to have a N:K_2O ratio of 1:1.25.

Zinc (Zn) & manganese (Mn)

At alkaline (high) pH values, Zn and Mn form solid compounds with low water solubility, decreasing significantly their availability to plants. On alkaline soils, soil applications of Zn and Mn fertilizers are ineffective. The least expensive way to correct effectively Zn and Mn deficiencies is through foliar sprays. Preliminary research data indicate little difference in magnitude of foliar uptake, regardless of the form of carrier or chelate applied.

Iron (Fe)

Iron is considerably less soluble than Zn or Mn in high pH soils. Thus, inorganic Fe contributes relatively little to the Fe nutrition of plants on calcareous soils. Citrus rootstocks vary widely in their ability to overcome Fe deficiency. The easiest way to avoid lime-induced Fe chlorosis in citrus trees to be planted on calcareous soils is to use tolerant rootstocks.

Existing Fe chlorosis can be corrected through soil application of Fe chelates.

Foliar application of iron compounds has not proven satisfactory on citrus trees because of poor translocation within the leaf. Furthermore, foliar sprays of Fe have the possibility to cause fruit and leaf burn.

Sulfur products used as soil amendments

Soil acidulents can improve nutrient availability in calcareous soils by decreasing the soil pH. Soils with visible lime rock or shell in the root zone would require repeated applications of a high rate of acidulent. Examples of S-containing acidulents include elemental sulfur (S) and sulfuric acid (H_2SO_4). These compounds act to neutralize $CaCO_3$ with acid. Ammonium sulfate [$(NH_4)_2SO_4$] acidifies the soil by converting NH_4^+ to NO_3^- during nitrification. The sulfate ion (SO_4^{2-}) alone possesses no acidifying power. Elemental S is the most effective soil acidulent. Although not an acidic material itself, finely ground elemental S is converted quickly to sulfuric acid in the soil through microbial action. Sulfuric acid reacts more quickly than any other material, but it is hazardous to work with and can damage plants if too much is applied at one time. Dilute concentrations of sulfuric acid can be applied safely with irrigation water and used to prevent Ca and Mg precipitates from forming in microirrigation lines. Repeated applications of sulfuric acid with irrigation water will tend to lower soil pH within the wetted pattern of the emitter.

The soil within the wetted pattern of a microirrigation emitter often becomes alkaline when the water contains bicarbonate, while the surrounding soil may be neutral or acidic. To lower the soil pH in this situation, acid or acidifying fertilizer must be applied to the wetted pattern only.

Summary of *citrus nutrition on calcareous soils*

1. Calcareous soils are alkaline because they contain free $CaCO_3$.

2. The availability of N, P, K, Mg, Mn, Zn, and Fe to fruit trees including citrus decreases when soil $CaCO_3$ concentration increases to more than 3% by weight. These soils generally have a pH value in the range of 7.6 to 8.3.

3. To avoid ammonia volatilization, fertilizers containing ammonium-N or urea should be moved into the root zone with rainfall or irrigation, or be incorporated into the soil.

4. Phosphorus fertilizer applied to calcareous soils becomes fixed over time. Plant P status can be evaluated using a leaf tissue test. If citrus leaf P is less than 0.12% indicating reduced soil P availability, then P fertilizer should be applied.

5. Trees planted on calcareous soils require above normal rates of K or Mg fertilizer for satisfactory nutrition. Foliar sprays of potassium and magnesium nitrates are effective where soil applications are not.

6. The least expensive and most effective way to correct Zn and Mn deficiencies of fruit trees is through foliar application of inorganic or organic chelated forms.

7. The easiest way to avoid lime-induced Fe chlorosis is to plant trees budded on tolerant rootstocks.

8. The most effective remedy for lime-induced Fe chlorosis on nontolerant rootstocks involves the use of chelated Fe.

9. Sulfur products that act as soil acidulents can potentially improve nutrient availability in calcareous soils.

$CaCO_3$ Neutralizing Power of Several S Sources	
Sulfur Source	**Amount Needed to Neutralize 1,000 lbs $CaCO_3$**
Elemental S	320 lbs
Concentrated sulfuric acid (66° Baume)	68 gal
Ammonium thiosulfate 12-0-0-26S	1,600 lbs
Potassium thiosulfate 0-0-25-17S	3,800 lbs
Ammonium sulfate 21-0-0-24S	900 lbs

Florida produces some of the earliest commercial-best quality peaches in North America. The University of Florida has developed high quality, low chilling, early maturing peach cultivars that can be grown from the panhandle to as far south as Immokalee. Low chilling cultivars can grow and produce fruit under Florida conditions. Furthermore, ripening of these cultivars during April and May ensures an early spring market window for tree-ripe fresh fruit in Florida before production from other southeastern states and California comes to market. Florida peach trees, on average, come into commercial production in 2-3 years and have about a 7- to 10-year life span because diseases and pests eventually weaken trees and decrease fruit production. In addition, newer cultivars with improved qualities are released frequently to replace older cultivars with problems that were not evident when they were first released.

Chilling Requirement

Peaches are temperate-zone plants that require a minimum amount of accumulated cool temperature exposure (below 45°F) to resume normal growth the following spring. This varies by cultivar and is referred to as the cultivar's chilling requirement. Chilling requirement is usually expressed in chill units (cu). Each cultivar has its own characteristic chilling requirement which partially determines its adaptability to a certain region of the state. Florida can be divided into north, north central, and central Florida down to Immokalee and Ft. Pierce, each region having a characteristic range of chilling hours. Peaches of currently available varieties cannot be grown successfully south of Immokalee because of insufficient chilling. Both **chilling requirement** and **chilling hours** are sometimes used interchangeably, but **chilling requirement** refers to the exposure to cool temperatures (between 32° to 55°F) necessary for the resumption of normal spring growth. Chilling usually occurs from November through January in central Florida. The model most used in the SE United States is the total number of hours below 45°F and above 32°F. Temperatures from 40 to 50°F are most effective, with higher or lower temperatures being less effective. When a peach cultivar is grown outside of its recommended area and has insufficient chilling, it may bloom late and not fruit normally. By contrast, if peach cultivars have too low chilling requirement for a given location, they tend to bloom early and can sustain fruit and tree damage during late winter freezes unless overhead irrigation is used to protect flowers and young fruit.

Melting versus Non-Melting Flesh, Clingstone and Freestone Peaches

Peaches can be categorized as having either **melting** or **non-melting flesh**. Non-melting peaches do not bruise as easily as melting flesh peaches during harvest and remain firm after canning. All non-melting types released by the University of Florida are **clingstone**, meaning that the flesh adheres to the pit or stone when fruit is ripe. Melting flesh peaches become soft when canned, have ragged edges when sliced during processing and can be either clingstone or **freestone** (flesh does not adhere to the pit when the fruit is ripe). Many melting flesh peach cultivars have been developed for the fresh market. However, when these melting flesh cultivars are harvested ripe, the fruit bruise easily and have a short shelf life. One solution to this problem is to harvest melting flesh peaches when they were not fully ripe, so that they were firm enough to resist bruising and last longer in grocery stores. However, although peaches become sweeter as they ripen on the tree, they do not become sweeter after they are harvested, especially when they are harvested before they are ripe. Note that most peaches can become softer when you leave them in your fruit bowl because the walls of individual plant cells break down, but the fruit will not become sweeter. Consequently, peach breeders have developed non-melting-flesh peaches for the fresh market so that growers can harvest and ship tree-ripe fruit with firm flesh that resists bruising and has a longer shelf life. Many of the recently released cultivars from the University of Florida peach breeding program have non-melting flesh. All **melting flesh** peaches released from the University of Florida breeding program begin with the prefix Florida. All **non-melting flesh** peaches from the University of Florida share the prefix UF.

Planting Situation

Site selection and cultivar choice rank as the two most important factors in successful peach growing. In selecting a site, avoid low areas characterized by late spring frosts. Even in central and SW Florida, freezes can occur throughout February in cold locations; thus, upland sites with good air drainage are essential for reliable production. Peaches can be grown on a wide variety of soils, provided they are well drained in the upper 4 to 6 feet. Avoid "hardpan" soils unless an excellent system of subsoil drainage tiles is provided. Normal tree spacing is 15 x 20 feet. All common peach cultivars are self-fruitful and should be planted in solid blocks for easier spraying and harvesting. Irrigation is usually needed during the fruit development period to obtain acceptable fruit size and yields. For low-volume irrigation systems, microsprinklers are preferred to drippers. A properly designed overhead sprinkler irrigation system has the advantage of protecting flowers and young fruit from late winter and spring freezes.

Cultural Program

Nematodes are common in Florida soils. Therefore, only nematode resistant rootstocks such as **Flordaguard** should be used in Florida. Peaches are susceptible to a number of pests including diseases and insects. A regular pest control program must be followed to ensure good fruit quality. Although, some diseases and insects can be severe, they can usually be controlled with a proper pest management program. More information is available on peach culture from the Cooperative

Extension Service, the Horticulture Sciences Department at the University of Florida, and the Immokalee IFAS Center.

Labor

Peach production requires high levels of seasonal hand labor. Commercial growers hire labor for pruning, fruit thinning, and harvesting. Family operations often supply their own labor. Timing of labor operations is very critical. A delay of two days in harvesting can possibly result in loss of all profits.

Marketing Situation

The incentives for growing peaches in Florida are: 1) production and marketing of fresh Florida peaches before California, central Georgia or South Carolina; and 2) production of quality fruit when there are almost no other quality fresh fruits of any kind in the markets. Peaches can generally be produced continuously from late April until late May in Florida, depending on weather. Summer rains make disease problems on peaches so great that late maturing cultivars have little or no potential in Florida. It is necessary to harvest each cultivar 3 to 4 times at 2-day intervals in order to obtain fruit that have reached the right stage for marketing. For long distance shipment, fruit must be carefully graded, sized, cooled and packed. This requires a sizeable investment in a packinghouse which is not likely to prove economically feasible with less than 50 acres. However, marketing alternatives for small growers include direct sales to grocery stores or produce markets, and u-pick or roadside stand operations. It is important that several cultivars are grown which ripen in succession. This helps with marketing and efficient use of harvest labor and packing facilities.

Cultivars for SW Florida	Estimated chill units	Bacterial spot resistance	Flower bud set
Flordaglo	150	8	9
Tropicbeauty	150	5	8
UFSun	100	7	10
1 = least desirable, 10 most desirable.			

There are many more Florida peach cultivars, see next page

Cultivar	Fruit Dev. (days)	Size (g)	Taste	Attractiveness
Flordaglo	78	94	8	8
Tropicbeauty	89	100	9	10
UFSun	90	130	10	9
1 = least desirable, 10 most desirable.				

For any information on stone fruit, contact the UF-IFAS stone fruit expert Dr. Mercy Olmstead in Gainesville at (352) 273-4772 or at mercy1@ufl.edu and visit her website http://hos.ufl.edu/extension/stonefruit/

THE UF-IFAS STONE FRUIT WEBSITE

http://hos.ufl.edu/extension/stonefruit/

Some EDIS publications on stone fruit

Peach, Plum and Nectarine Production

... **Peach**, Plum and Nectarine Production. Subtopics. **Peach**, Plum, and Nectarine Pest Management; **Peach**, Plum and Nectarine Products and Recipes. Publications. **...**
edis.ifas.ufl.edu/topic_peaches_and_nectarines - 7k

Peach, Plum, and Nectarine Pest Insect Management

... **Peach**, Plum, and Nectarine Pest Insect Management. **...** Green **Peach** Aphid, Myzus persicae
(Sulzer) (Insecta: Hemiptera: Aphididae); Insect Management in Peaches; **...**
edis.ifas.ufl.edu/topic_stone_fruit_pest_insects - 7k

Peach, Plum, and Nectarine Pest Management

... **Peach**, Plum, and Nectarine Pest Management. Subtopics. **Peach**, Plum, and Nectarine
Disease Management; **Peach**, Plum, and Nectarine Pest Insect Management; **...**
edis.ifas.ufl.edu/topic_peach_and_nectarine_ipm - 6k

Peach & Nectarine (HS)

... Advanced Search; **Peach** & Nectarine (HS). Publications. Alternative Opportunities for Small Farms: **Peach** and Nectarine
edis.ifas.ufl.edu/topic_hs_peach-nectarine - 6k

Peach, Plum, and Nectarine Disease Management

... **Peach**, Plum, and Nectarine Disease Management. Subtopics. **...** IFAS Research. Related
edis.ifas.ufl.edu/topic_stone_fruit_diseases - 6k

Peach, Plum, and Nectarine Weed Management

... Advanced Search; **Peach**, Plum, and Nectarine Weed Management.
edis.ifas.ufl.edu/topic_stone_fruit_weeds - 6k

HS1108/HS364: Strategies for Subtropical **Peach** Production in **...**

... Strategies for Subtropical **Peach** Production in Florida
edis.ifas.ufl.edu/hs364 - 19k - 1998-10-30

HS1110/HS366: Rootstocks for Florida **Peaches**, Nectarines, and **...**

... Although a large number of rootstocks are available for stone fruit in other locations and climates, only 'Flordaguard' **peach** rootstock is currently **...**
edis.ifas.ufl.edu/hs366 - 19k - 1998-10-30

HS1125/HS342: Florida Subtropical **Peaches**: General Concepts and **...**

... The University of Florida has developed high quality, low chilling, early maturing **peach** and nectarine cultivars that can be grown from the panhandle to as far **...**
edis.ifas.ufl.edu/hs342 - 50k - 2007-07-01

HS1111/HS365: Training and Pruning Florida **Peaches**, Nectarines **...**

... Fruit from Florida's early maturing **peach**, nectarine Prunus persica (L.) Batsch), and Japanese plum cultivars (Prunus salicina Lindl.) mature in April and May.
edis.ifas.ufl.edu/hs365 - 23k - 1998-10-30

ENY-804/IG075: Insect Management in **Peaches**

... Insect Management in Peaches for Commercial **Peach** Production. **...** **Peach** Tree Borer and Lesser **Peach** Tree Borer **...**
edis.ifas.ufl.edu/ig075 - 31k - 2008-01-17

HLB ESCAPE TREES

To accelerate citrus gene discovery for HLB tolerance/resistance, UF-IFAS Citrus Researchers and Extension Agents are working closely with the citrus industry. They would like to know about trees that appear to be doing better than their cohorts in groves declining from HLB. We need your help in reporting to us about escape trees or potential survivor trees in your groves. Please contact Mongi Zekri (maz@ufl.edu or 863 674 4092) or any other citrus extension agent to determine if your trees meet this research criterion.

HLB Escape Tree Survey Form

Grove Name or Owner: _____

Location Contact: _____

Mailing Address: _____

Phone Number: Office: _____ Cell: _____

Email Address: _____

Grove Location:

County: _____

Grove Address or Other Identifying Information: _____

TRS: _____ Block Number: _____

Row and Tree Number or GPS Location: _____

Block Information:

Variety: _____

Rootstock: _____

Year Planted: _____

Soil Type: _____

Approximate Tree Height: _____

HLB Symptoms Present in Noted Tree: YES _____ NO _____

Tree Condition in Adjacent Block or Grove: _____

Nutritional Program: Foliar: _____ Soil: _____

Have Microbes been applied to the grove and if so, what type and when?

_____

_____

Form Completed By: _____ Photos or Samples Submitted: _____

Florida Gulf Citrus Growers Association

Florida Gulf Citrus Growers are good neighbors and good stewards of the land. They are keenly aware that they must carefully balance the needs of the environment and the needs of citrus growing. This delicate balance starts in the basic design of the groves, and then to the use of the latest technology and the most progressive management practices. All these factors enable Florida Citrus Growers to be sustainable in this region. Growers carefully manage the water resources through state-of-the-art low volume computerized irrigation systems, spraying water directly to the root zone. There are many other positive impacts that citrus groves have on the environment. Go to http://www.gulfcitrus.org/ and become a member or an associate member.

GULF CITRUS GROWERS ASSOCIATION SCHOLARSHIP FOUNDATION, INC.

Membership:

Membership in the Scholarship Foundation is open to all Gulf Citrus Growers Association (GCGA) members for just $25 per year. Members are able to vote for and serve on the Board of Directors for the Foundation.

Donations:

Donations are a crucial source of funding for scholarship awards and may be made to the Foundation at any time during the year in any denomination, **regardless of membership status**. Checks should be made payable to the Foundation. For more details, please call the GCGA office at **(239) 690-0281.**

The GCGA Scholarship Foundation is a non-profit corporation operating under Section 501 © (3) of the Internal Revenue Code. Contributions are tax deductible as allowed by law.

Gulf Citrus Growers Association Scholarship Foundation, Inc.

11741 Palm Beach Blvd., #202, Fort Myers, FL 33905
Phone: (239) 690-0281 / Fax: (239) 690-0857 / Email: gulfcitrus@embarqmail.com

About the Gulf Citrus Growers Association

The citrus growers of southwest Florida are committed to supporting education as a long-term investment in the future of our industry. The first Gulf Citrus scholarship was awarded in 1992 through the Gulf Citrus Growers Association, a trade organization representing growers in Charlotte, Collier, Glades, Hendry and Lee Counties.

The Gulf Citrus Growers Association Scholarship Foundation was established in 2000 as a non-profit entity to oversee the distribution of these awards. Scholarship applications are accepted throughout the year and are reviewed semi-annually by a Scholarship Selection Committee comprised of academic and industry members. The number and amount of awards vary depending upon the number of applications received and available funds.

Applicants who are not selected may submit a new application for consideration in the next selection cycle. Previous award winners may also reapply.

Scholarship Criteria

Preferred requirements for scholarships are as follows:

AA, BS, MS and **PhD Degrees:**

- Completion of all placement testing and a **declared major** in agriculture or related major.
- Completion of **12 credit hours** towards agriculture or related degree.
- Minimum overall grade point average of **2.5** for AA and BS degrees; **3.0** for MS and PhD degrees.
- A demonstrated **commitment** to complete the degree at a state college, community college or university.

Applicants must send their transcripts including grades for the courses taken the previous semester and complete the attached application, which includes a statement of release giving the selection committee permission to verify information submitted.

APPLICATION DEADLINES ARE JULY 31 AND DECEMBER 31

Gulf Citrus Growers Association Scholarship Foundation, Inc.

11741 Palm Beach Blvd., #202, Fort Myers, FL 33905
Phone: (239) 690-0281 / Fax: (239) 690-0857 / Email: gulfcitrus@embarqmail.com

Scholarship Application

Personal Data

Name: _____Date of Birth:_____

Home Address: _____

City/State: _____ Zip: _____ Phone: _____

Mailing Address: _____

City/State: _____ Zip: _____ Phone: _____

E-mail: _____

Employer: _____

Address: _____

City/State: _____ Zip: _____ Phone: _____

Does your employer reimburse you for tuition or other expenses incurred toward your degree? Yes ____ No _____

Educational Information

College or University in which you are enrolled: _____

Department / Degree Program: _____

I am working toward the following: AA ____ BS _____ MS _____ PhD _____ Other _____

Courses Taken in Major *(completed)*:

_____

_____

_____

_____

Courses (*in which you are currently enrolled*):

_____

_____

Total Credit Hours Toward Degree: _____ Cumulative Grade Point Average (GPA): _____

Expected Date of Graduation: _____

Please answer the following questions in complete sentences with as much detail as possible.

What are your career goals? _____

_____

_____

_____

_____

What is the potential value of your education to the citrus industry *in southwest Florida*?

_____

_____

_____

_____

_____

I authorize the release of this application and any relevant supporting information to persons involved in the selection of recipients for Gulf Citrus Growers Association scholarships.

_____ _____

Applicant's Signature Date

*****APPLICATION DEADLINES ARE DECEMBER 31 AND JULY 31*****

Please return this application with your official transcripts to:

Gulf Citrus Growers Association Scholarship Foundation, Inc.
Dr. Mongi Zekri, Application Coordinator
Hendry County Extension Office
P. O. Box 68
LaBelle, FL 33975
Phone: (863) 674-4092 / Fax: (863) 674-4636
E-mail: maz@ufl.edu

Flatwoods Citrus

☐ If you did not receive the ***Flatwoods Citrus*** newsletter and would like to be on our mailing list, please check this box and complete the information requested below.

☐ If you wish to be removed from our mailing list, please check this box and complete the information requested below.

Please send: Dr. Mongi Zekri
Multi-County Citrus Agent
Hendry County Extension Office
P.O. Box 68
LaBelle, FL 33975

Subscriber's Name:_____

Company:_____

Address:_____

City:_____State:_____Zip:_____

Phone:_____

Fax:_____

E-mail:_____

Racial-Ethnic Background

__American Indian or native Alaskan
__Asian American
__Hispanic
__White, non-Hispanic
__Black, non-Hispanic

Gender

__Female
__Male